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Assessing the Effect of Foster-Children Supply on Biological Children Education Demand: Some Evidence from Cameroon

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Abstract In Cameroon, around 18 percent of children aged between 10-14 years old grow up within a sibship extended to host one (or more) foster-child. This proportion is similar in other African countries and in particular West African ones. This paper aims at estimating the effect of foster-children supply on biological children education demand of host parents in Cameroon. To address the endogeneity of foster-children supply, we estimate both decisions within a recursive bivariate probit framework and use, as our identifying variable, the father's birth order among his brothers. Indeed, in patrilineal societies as in Cameroon, kinship rules involve children to be hosted by brothers of the male kin group, and more likely by the eldest. Using data from the demographic and health survey of Cameroon (2004), a dataset uniquely suitable for our purpose since information on the father's birth order are available, we find that children hosting school-age foster-relatives have a significant lower probability to attain their basic level of education relative to those who do not. This suggests that households hosting school-age foster-relatives due to kinship rules suffer from liquidity constraints preventing them from educating further their biological children. Through this result, we highlight the importance of the motive underlying child fostering to determine its spillover effects.

Keywords: Household Structure, Child Fostering, Extended Sibship, Cameroon

JEL Classification Numbers: I2, J1, O1

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1 Introduction

The non-traditional structure of households in developing countries has long been highlighted as an important determinant of these households' welfare by a number of economists. Its relevance has been shown not only for labor sharing and risk pooling (Udry, 1994 ; Cain, 1981) but also for information flows (Rosenzweig and Wolpin, 1985) and resource pooling for children education (Lloyd and Blanc, 1996). Recently, economists have questioned the welfare effects of the non-traditional structure of African sibships on children themselves (Serra, 2009; Akresh, 2007; Taiwo, 2007; Evans, 2004; Lloyd and Desai, 1992). In particular, following the expansion of AIDS pandemic in these countries, the question of the impact of orphans supply on the welfare of host parents' biological children has been raised (Taiwo, 2007; Evans, 2004)[1]. In this paper, we are more particularly interested in the effect of foster-children supply on the welfare of host parents' biological children[2].

Well-documented by anthropologists and demographers, the practice of child-fostering is widespread in developing countries and in particular in West African ones (Isiugo-Abanihe, 1985)[3]. According to the DHS report of 11 West African countries, the proportion of foster-children among children younger than 14 years old varies between 5.9 percent in Burkina-Faso to 16.8 percent in Liberia and equals in average to 9.5 percent in the region (table1). With such a prevalence rate, the probability for a child to grow up in a household hosting a foster-child is therefore high in these countries. In Cameroon, for instance, 18 percent of children aged between 10 and 14 years old and raised by both of their biological parents live with one or more foster-children[4].

[1]While Evans (2004) finds no significant impact of hosting orphans on biological children education on a sample of African countries, Taiwo (2007) finds a significant positive effect on the youngest biological children health outcomes in Malawi.

[2]Foster-children are non-orphaned children sent by their biological parents to another home where they are raised and cared for by host parents (Isiugo-Abanihe, 1985).

[3]The practice has been observed in different parts of the world, such in Ivory-Coast (Ainsworth, 1992); in Cameroon (Notermans, 2008; Verhoef, 2007); in Senegal (Vandermeersch, 2002), in Burkina-Faso (Akresh, 2007); in South Africa (Zimmerman, 2003; Cichello, 2003); in Oceania (Keesing, 1970); in Haiti (Rawson and Beerggren, 1973); in the West Indies (Isiugo-Abanihe, 1985), but as noted by Isiugo-Abanihe (1985), nowhere it is as institutionalized as in West African countries.

[4]Author's calculation from the Cameroonian Demographic and Health Survey (2004).

Yet, the impact of foster-children supply on the welfare of host parents' biological children has not been questioned by economists[5]. An empirical investigation appears all the more necessary as no clear-cut conclusion can be drawn from existing theoretical models on intra-household resource allocation (Becker, 1994; Behrman et al., 1982, 1986)[6]. According to the latter, children education is determined by several factors (preferences, returns to education, credit constraints) which are different channels through which foster-children supply could have an impact. If the channels are easily identified, the way they are affected by the supply of foster-children is however less clear. For instance, depending on the initial level of wealth of the host household as well as on the reason why children are hosted, the credit constraints initially faced by the host household might either tighten, lessen or remain unchanged following the arriving of the child. Since the effect of foster-children care on the initial level of credit constraints is unclear, its final effect on biological children education cannot be determined. Akresh (2007) is the only exception. Obtained results are however mixed. Using original data collected at the level of a province in Burkina-Faso in 2002, the author shows, using a child level fixed effect estimation, that young children (aged between 5-7) significantly benefit from hosting foster-children in terms of school enrollment relative to those who do not. This is no more significant in a household level fixed effect estimation. Concerning the eldest children (aged between 12-15), while in a child fixed effect estimation they are found to significantly suffer from hosting foster-children in terms of school enrollment relative to those who do not, in a household level fixed effect one, again, the effect looses its significance. Middle aged children (between 8-11) do not appear to be affected by foster-children supply in any of the specification considered.

In this paper, as in Akresh (2007), we are interested in measuring the effect of foster-

[5]Economic, demographic and anthropological literatures have mainly questioned the determinants of child fostering (Isiugo-Abanihe, 1985; Ainsworth, 1992; Verhoef, 2005; Akresh, 2007; Serra, 2009) and its impact on foster-children themselves (Ainsworth 1992; Zimmerman, 2002; Cichello, 2003; Akresh, 2004; Eloundou-Enyegue and Shapiro, 2005; Notermans, 2008; Verhoef, 2005). Empirical evidence is however mixed due to the difficulty to find an appropriate counter-factual.

[6]Besides being unconclusive, existing models on intra-household resource allocation are likely to be irrelevant to deal with resource allocation between children in the context of African household and sibships (Fapohunda and Todaro, 1988).

children supply on biological children education demand of host parents. But different from Akresh (2007), we use Cameroonian data collected at a national level and estimate the effect of interest using a different empirical strategy to address the endogeneity of foster-children supply in the biological children education decision. Indeed, households receiving foster-children might be chosen by the biological parents according to characteristics that determine also their decision to educate their own children. If such characteristics are unobserved by the researcher, then probit estimation of the effect of foster-children supply on biological children education demand of host parents will be biased due to household level unobserved heterogeneity. Probit estimation will also be biased if children have unobserved characteristics correlated with both decisions to host a foster-child and to be educated. Akresh (2007) addressed these issues by collecting retrospective information covering the years 1998 to 2000 concerning the child's school enrollment history. He then compared children hosting foster-children with children belonging to households not involved in child fostering using the school enrollment from the year before and the year after the foster-child is supplied for the first group and using 1999 and 2000 enrollment for the second group[7]. The impact of hosting a foster-child on school enrollment is then estimated using a household fixed effects regression to control for household level unobserved heterogeneity[8]. To control further for child level unobserved heterogeneity, the author estimated also a child level fixed effect regression.

Since the information available to us has a more standard format (we do not have retrospective information), we deal with the unobserved heterogeneity using a different strategy. We estimate both decisions to educate one's biological child and to host a foster-child within a recursive bivariate probit framework. To obtain consistent and efficient estimate of the effect of foster-children supply on biological children education demand, we estimate the model by maximum likelihood, as a bivariate probit (Greene, 1998; 2004) and use the father's birth order among his brothers as our identifying variable. Indeed, the father's birth order among

[7]As noted by the author, results remain similar if years 1998 and 1999 were chosen instead of 1999 and 2000.

[8]Difference-in-differences estimator is similar than the one obtained with fixed-effect regression.

his brothers determines his probability to host a foster-child, at least in our context, and does not explain his decision to educate his own children through channels we do not observe. The first point is not only inferred from existing kinship rules as highlighted by the anthropological literature but is also supported by our descriptive statistics. In patrilineal societies, which is the context of our analysis, kinship rules involve children to belong to the male kin group and if they are fostered, they are likely to be sent to the father's brothers' home. Since a group of brothers is headed by the eldest brother, the eldest brother is more likely to receive children fostered according to these kinship rules than all other siblings. In our sample, we observe indeed that households headed by a male who is the eldest brother of his sibship receive significantly more foster-children than households headed by a male who is not. The second point is supported by the fact that the channels through which the father's birth order among his brothers could affect his decision to educate his own children are observed in our dataset and thus controlled for. Through this strategy, we address the household level unobserved heterogeneity but not the one derived from child level. We discuss however the extent to which the latter affect the obtained results.

To estimate the model, we use data from the Cameroon Demographic and Health Survey (CDHS) collected in 2004. Cameroon is the only country, dominated by patrilineal ethnic groups, for which DHS gathers information on the father's sibship size and composition and thereby on his birth order. This dataset is therefore an unique opportunity to estimate consistently and efficiently the impact of foster-children supply on biological children education demand of host parents in patrilineal societies.

Our bivariate probit estimation results show that the probability of biological children, aged between 10-14 years old, to attain their basic level of education decreases of about 37 percentage points when hosting school-age foster-relatives. Given the identification strategy adopted, this suggests that households hosting school-age foster-relatives due to kinship rules suffer from liquidity constraints preventing them from educating further their biological children. Through this result, we highlight not only a new important determinant of hosting a foster-child, the birth order of the father among his sibship, but also its negative effect on the educational attainment of host parents' biological children.

We structure the remainder of the paper as follows. The second section presents the conceptual framework, introducing the empirical challenges we face as well as the econometric methodology we adopt to deal with them. The third section introduces the CHDS dataset. The fourth section presents the estimation results and the fifth one concludes.

2 The Conceptual Framework

2.1 Empirical Issue

Estimating the effect of foster-children supply on biological children education demand of host parents raises a potential major empirical issue: unobserved heterogeneity. Unobserved heterogeneity is driven by the fact that households hosting foster-children differ from those who send them on some characteristics that are unobserved and could also affect their biological children education demand. If so, probit estimation of the effect of foster-children supply on biological children education demand will be biased due to household level unobserved heterogeneity, the sign of the bias depending on the correlation of the omitted household's characteristics with the supply of foster-children as well as with the demand for biological children education.

To define the characteristics in which sending and receiving households could differ from each other having in mind the different motives underlying child fostering is of particular interest. According to Isiugo-Abanihe (1985), children are fostered for four major motives: increase their social mobility (social mobility fostering), manage an economic shock faced by the biological home (crisis fostering), satisfy the labor needs of the host household (domestic fostering) and answer to the obligations and rights shared by members of a kin group and defined by kinship rules (kinship fostering).

To increase a child's social mobility, parents are used to relying on two main channels:

increase his schooling and learning opportunities and enhance his access to economic, religious, political networks. Thus, households with higher resources to send children at school or with a higher preference for child quality relative to sending households are more likely to host children fostered for such a reason. Similarly, households headed by a leader of a highly influential community have also a higher probability to receive children fostered to increase the latter social mobility. Child fostering can also be driven by an economic crisis and used as an ex-post risk management. In such a case, children are likely to be sent to households who do not face a similar shock than the biological home or who are more able to manage it because, for instance, their income resources are more diversified relative to those of sending households. Children can also be sent to households with higher labor needs and therefore asking for foster-children[9]. Finally, children can be exchanged between members of a kingroup, depending on the obligations and rights they share and defined by kinship rules. In sum, sending and host households differ from each other in terms of their resources to send children at school, their preference for child quality, their involvement in influential communities, their ability to manage economic shocks, their labor needs and their relative obligations and rights as members of a kin group.

The existence of such differences between both types of households is not an issue *per se* for our objective. It will be if the differences suggested are unobserved by the researcher while determining the amount of education host households invest in their children. For instance, part of the foster-children supply is positively related to a better access to school facilities which should increase the ability of host households to educate their own children. If such an access is not observed in the data and therefore omitted in a probit estimation, then the estimated effect of foster-children supply on biological children education demand will be up-ward biased, capturing actually the positive effect of higher access to school inputs. An up-ward bias will also emerge if the host households' access to influential networks is not

[9]As noted by Serra (2009), labor motives of host households and schooling motives of sending households can coexist and explain the level of child fostering in an economy. Besides, even though children are hosted to fulfill labor needs, they might still be in a better situation than they would have been if they stayed in their biological homes (Zimmermann, 2003).

observed while it is likely to affect positively the demand for biological children education. If children are sent to a household to fulfill labor needs and if the latter prevent the host parents' biological children from going to school, then probit estimation will be downward biased if the labor needs within the household are not observed and controlled for. Since most of the suggested characteristics in which sending and host households differ are correlated with the latter decision to educate their own children and are unobserved, at least in our dataset, probit estimation of the effect of foster-children supply on biological children education demand does not appear as the best strategy to estimate consistently and efficiently the impact of foster-children supply on biological children education demand.

Probit estimation of the effect of interest will also be biased if there is unobserved heterogeneity at the child level. Such heterogeneity will emerge if parents sent their children in a household according to some characteristics of the household's children, that are unobserved and determine these children performance at school. For instance, one can argue that parents prefer sending their children in a household where resident children show higher ability at school so as foster-children benefit from positive externalities. If such abilities are unobserved, then probit estimate of the effect of foster-children supply on biological children education will be up-ward biased. If parents host children because of the low educational performance of their own children, and if we do not control for it, then probit estimation will be downward biased.

To address the bias derived from unobserved heterogeneity and obtain a consistent estimate of the effect of interest, we adopt a recursive bivariate probit model (Greene, 1998, 2003)[10].

[10]The two steps procedure as described in Rivers and Vuong (1988) is appropriate to deal with the endogeneity bias driven by unobserved heterogeneity when the suspected endogenous variable is continuous.

2.2 Estimation Strategy

2.2.1 The Recursive Bivariate Probit Model

The demand for a biological child's education Y and the supply of foster-children W are described by the following latent variable models:

$$Y^*_{ihv} = \beta' X_{ihv} + \delta W_{hv} + \epsilon_{ihv} \tag{1}$$

$$W^*_{hv} = \mu' Q_{hv} + \upsilon_{hv} \tag{2}$$

where Y^*_{ihv} is the unobservable net utility a biological child i belonging to the household h in the village v receives from being educated. Similarly, W^*_{hv} is the unobservable net utility a household h receives from hosting a foster-child. We note X_{ihv} and Q_{hv} two vectors of exogenous observed characteristics affecting the decision to educate one's biological child and to host a foster-child respectively. To allow for the possibility that the unobserved determinants of both decisions are correlated, we assume that the disturbance terms υ_{hv} and ϵ_{ihv} are jointly normally distributed with E[υ_{hv}]=E[ϵ_{ihv}]=0, Var[υ_{hv}]= Var[ϵ_{ihv}]=1 and corr(υ_{hv},ϵ_{ihv})= ρ.

A child will pursue his education and a household will host a foster-child if the expected associated net utilities are positive. Y^*_{ihv} and W^*_{hv} are related to the binary dependent variables Y_{ihv} and W_{hv} by the following rule:

$$Y_{ihv} = 1 \text{ if } \mathrm{Y}^*_{ihv} \geq 0 \text{ and } 0 \text{ otherwise} \tag{3}$$

$$W_{hv} = 1 \text{ if } \mathrm{W}^*_{hv} \geq 0 \text{ and } 0 \text{ otherwise} \tag{4}$$

Equations (1)-(4) are the general specification of a recursive bivariate probit model. This model has two interesting features. First, it is consistently and efficiently estimated, by maximum likelihood, as a bivariate probit one as if there were no joint determination in the first equation (Greene, 1998, 2003). Indeed, the probabilities associated to the four possible states of the world (Y=0 or 1 and W=0 or 1) are exactly those that enter the usual likelihood function for the bivariate probit model. Second, it is identified even if X_{ihv} and Q_{hv} include the same varying exogenous regressors (Wilde, 2000). Indeed, the non-linearity of both equations of the model ensures, theoretically, its identification. In other words, we do not need to define an exclusion restriction on Q_{hv}, that is a variable included in Q_{hv} but not in X_{ihv}, to identify the model[11]. However, as argued by Monfardini and Radice (2008), this result strongly relies on the assumption of normal distribution. Therefore, in practice it is better to introduce an exclusion restriction since it might help in making the estimation results more robust to distributional misspecification. We call such a variable Z.

2.2.2 Identification hypothesis

In our context, Z will be a relevant exclusion restriction if it explains the household's decision to host a foster-child but does not explain the biological child's decision to pursue his education through channels, besides the presence of foster-children, we do not observe and control for (Deaton, 2009). Said differently, Z has to be uncorrelated with the unobserved determinants of the biological child's education decision noted, here, ϵ_{ihv}.

Given our previous discussion on child fostering motives, Z cannot include determinants of social mobility or crisis fostering or even domestic labor fostering since the characteristics of households receiving children for these purposes are also potential unobserved determinants of their demand for biological children education. On the contrary, we believe that Z can include determinants of kinship fostering. Kinship fostering involves children to be exchanged among kinsmen according to the obligations and rights they share and defined by kinship rules (Isiugo-Abanihe, 1985). We propose to infer from these rules which member of a kin group is more likely to receive foster-children. According to these rules, a group of brothers

[11]The statement of Maddala (1983), suggesting that the parameters of the second equation are not identified if Q_{hv} includes all the variables in X_{ihv} is misleading. As noticed by Wilde (2000), it is only valid when Q_{hv} and X_{ihv} are both constants (in Monfardini and Radice, 2008).

from the male kin group is more likely to receive children in patrilineal societies because children are considered to be part of the male's kin group and not of the female's one (La Ferrara, 2007; Taiwo, 2007). Since such a group is usually headed by the eldest brother, the latter should receive more children fostered according to the kinship rules than all of his other siblings. In contrast, a group of sisters from the female kin group is more likely to receive children in matrilineal societies because children belong to the female's kin group and not to the male's one. Since a group of sisters is headed by the eldest one, the latter should receive more children fostered according to the kinship rules than all of her other siblings (Taiwo, 2007)[12]. In other words, sending and host households differ from each other on an additional characteristic: the birth order of the father among his brothers (respectively, of the mother among her sisters) in patrilineal societies (respectively, in matrilineal societies).

In Cameroon, a country where most of the ethnic groups are patrilineal, we should therefore observe that households headed by a male who is the eldest of his brothers receive more children than households headed by a male who is not, if children are fostered according to the kinship rules[13]. We propose in table2 to compare the number of foster-children hosted by the households of our children sample depending on whether the male care-giver is the eldest of his brothers or not. As we will explain latter, we are interested in 925 biological children aged between 10-14 years old belonging to 604 households. 329 of them are headed by a male care-giver who is the eldest of his brothers and 275 are headed by a male care-giver who is not[14]. The number of foster-children measured is the number of foster-children aged between 6 to 14 years old (school-age) and reported as being relatives (other than

[12] Actually, in matrilineal societies, this is the eldest brother of a group of sisters who head the group (La Ferrara, 2007). However, children are used to be sent to the eldest sister, in particular the orphans (Taiwo, 2007). Taiwo (2007) uses this implicit-child rearing practice to identify the effect of maternal orphans supply on fertility and biological children health in matrilineal ethnic groups of Malawi.

[13] According to the ethnographic atlas of Murdoch initiated in 1967 and regularly updated, the ethnic groups in Cameroon are all patrilineal except the Kom living in the North West of the country.

[14] They are children raised at least by their biological mother, according to the fertility survey, and for which information on the birth order of their male care-giver is available. At 85 percent, the male care-giver (the head) is the father of the children considered, otherwise he is a step-father. The male care-giver's birth order is determined relative to his sibship members who are alive at the date of the survey.

foster-grand-children) of the male care-giver[15].

Within this sample, as expected, households headed by a male who is the eldest of his brothers host in average more school-age foster-relatives (other than foster-grand children) than the others. Precisely, the former host in average 0.131 of these children while the latter host in average 0,076. The difference is significant at ten percent level. It appears further that households of the first group host in average less school-age foster-non-relatives compared to households of the second group. The difference is also significant at ten percent level. This is consistent with the anthropoligical-based assumption that children belonging to the male kin group and fostered according to the kinship rules are likely to be sent to the home of the father's eldest brother while there is no reason for this to be true for children who do not belong to the kin group.

If these statistics validate our strategy to explain the foster-children supply in Cameroon by one determinant of kinship fostering, the male care-giver's birth order among his brothers, this is not sufficient to ensure the identification of the model. Indeed, the latter implies further that the male care-giver's birth order among his brothers does not affect his decision to educate his own children through channels, besides the foster-children supply, we do not observe and thereby captured by the error term, here, ϵ_{ihv}. Households headed by a male who is either the eldest of his brothers or who is not are likely to differ from each other on characteristics that could have an impact on their decision to educate their own biological children. First, both types of households are likely to differ on demographic characteristics basically because of life-cycle reasons. In particular, households headed by a male who is the eldest of his brothers are likely to have more biological children than the others simply because there are headed by older men. If the number of children is associated with lower amount of education invested in children (Becker and Lewis, 1973), then children belonging to households headed by a male care-giver who is the eldest of his brothers should receive

[15] We do not consider neither the foster-grand-children nor the foster-non relatives because our identification hypothesis is relevant in the case of children being relatives of the male care-giver (since by this way they belong to the male kin group) other than grand-children (since children are fostered among the father's brothers and not to grand-parents.

less education than other children. Both types of households are also likely to differ in terms of the level of education attained by the male care-giver. First-born children are likely to receive less education than their later-born siblings because they are used to be asking by their parents to help them in taking care of the younger. If so, children whose male care-giver is the eldest of his brothers should receive less education than children whose male care-giver is not since they belong to lower educated households and since lower educated care-givers might have a lower preference for child quality and/or lower resources to devote to children's education. Besides, if accumulated wealth increases with age, then older siblings should be wealthier than younger ones. If so, children whose male care-giver is the eldest of his brothers should receive more education than children whose male care-giver is not since they belong to wealthier households and since wealth is associated with lower credit constraints and opportunity costs of education.

We propose in table2 to compare both types of households on the three above-metionned characteristics. The number of ever-born children is measured by the number of pregnancies a male care-giver's wife, who resides in the household, ever had and we also compute the number of dead children to see whether patterns of child mortality differ between both types of households. As expected, households headed by a male who is the eldest of his brothers have on average more pregnancies than other households and the difference is significant. The difference in the number of dead children is however not. The male care-giver's education is measured by his educational attainment which is a 6-ordered dummy variable from no education (0) to higher education (5). As expected households headed by a male who is the eldest of his brothers attained a lower level of education than the others and the difference is again significant. A similar pattern is observed if we measure the wife's level of education attained[16]. In terms of accumulated wealth, proxied using the wealth indicator calculated by DHS, if the difference in the measure between both types of households is significant, the sign is however not the one expected. This suggests that accumulated wealth is determined

[16]Note that in polygynous households, the wife's education measured is the one of the first spouse.

more by education than by age.

Since the three channels through which the male care-giver's birth order among his brothers could affect his demand for his own children education are measured in our dataset, we include them in X_{ihv} (as well as in Q_{ihv}) to control for their effect. By this way, we ensure the relevance of our identification strategy and can define our exclusion variable Z as a binary variable that equals one if the household's male care-giver is the eldest of his brothers and zero otherwise. Using such a variable to identify our model enables us to capture household level unobserved heterogeneity but the one defined at the child level. We discuss however the extent to which the latter could affect the obtained results.

3 The Data

3.1 The CDHS 2004

To our knowledge, Cameroon Demographic and Health Survey (2004) is the only survey implemented in Africa providing information on the sibship size and composition of the male care-givers[17]. Since most ethnic groups living in Cameroon are patrilineal, the availability of such information is an unique opportunity to identify the effect of foster-children supply on biological children education in the country.

For the purpose of our analysis, we focus on a sample of usual resident children who are the biological children of the female spouse according to the fertility history. For 85 percent of them, they are also the biological children of the male care-giver (the household's head), otherwise the male care-giver is the step-father[18]. We then reduce this biological children sample to the one for which information on the sibship size and composition of the male care-giver is available. Only a subsample of males are indeed interviewed on this item: one household on two is first picked up for the male interview; and among the picked-up

[17]Females in DHS are systematically interviewed on this item, but not males.

[18]This information is obtained given the relationship reported between the the male care-giver and the child and the number of unions reported by the interviewed mother.

households, eligible men, that is men who are residents of the household and aged less than 59 years old, are interviewed (Cameroon DHS report, 2004; p 12.)[19]. Since we are interested in explaining basic level of education attainment, which corresponds to the 5th level of primary education, we finally focus on biological children aged between 10 and 14 years old which yields to a sample size of 925 observations. Indeed, according to the Cameroonian educational system, all children of 10 years old should have attained their basic level of education unless they repeated one or more grades or started schooling with delays.

The CDHS has an additional interesting feature: the roster provides information on the residence and survival status of biological parents of all household members less than 17 years. From this, we define non-biological children as any household member, less than 17 years, whose both biological parents are absent from the household where they reside. Foster-children are then defined as non-biological children whose both biological parents are absent but alive. We exploit further the relationship between the identified foster-child and the household's head as reported by the latter to determine whether the foster-child is a grand-child, or an other relative or a brother/sister of the household's head or a non-relative. Such distinctions might be interesting as the relative genetic closeness between the household's head and the reared child might influence the behavior of the former toward the latter (Hamilton 1964a, 1964b; Case et al., 2001; Cox, 2007).

3.2 Descriptive Statistics

According to table3, 18 percent of the biological children of our sample host one (or more) foster-child aged between 0-17 years old. Since the biological children education is more likely to be affected by the presence of school-age foster-children, because both of these children will compete for the same educational resources, we focus on school-age foster-children, that is foster-children aged between 6-14 years old. 10.16 percent of the

[19] Reducing the sample in such a way leads finally to consider only children living in their household with both parents and omit those whose father or male care-giver is absent either due to death, divorce or migration.

biological children considered host one (or more) school-age foster-child. It appears further that 30 percent of the hosted school-aged foster-children are relatives of the household's head other than grand-children. Put it differently, biological children are more likely to host school-age foster-relatives other than foster-grand-children, or foster-brothers and sisters or foster-non relatives. We therefore focus on the impact of school-age foster-relatives other than grand-children supply on biological children education demand. In the following, for sake of simplicity, school-age foster-relatives refer to school-age foster-relatives other than foster-grand-children. The proportion of school-age foster-relatives among the hosted foster-children is not the only argument for such a focus. Our identification hypothesis is relevant to explain these children supply more than the one of grand-children, or brother or sisters or of non-relatives[20].

In table4, we provide descriptive statistics for the whole sample of biological children considered as well as for two sub-samples depending on whether the biological child hosts a school-age foster-relative or not. The difference in the educational outcomes is particularly striking between both sub-samples. While 87 percent of the biological children who do not host any school-age foster-relative are enrolled in school, 100 percent of those hosting one or more are. Similarly, while 47 percent of the biological children who do not host any school-age foster-relative have attained the 5th level of primary education, that is the basic level of education, 63 percent of those hosting one or more have.

Such differences might be explained by factors other than the presence of school-age foster-relatives in the household. Indeed, the two sub-samples differ from each other on several individual, household and community level characteristics. For instance, there are more males than females in the sub-sample of biological children hosting one (or more)

[20]Although we are not interested in this paper in their particular impact, we are able to identify orphans and can count the number of them hosted by the biological children of our sample. Defining single-orphans as non-biological children whose a biological parent is dead and the other absent and double-orphans as non-biological children whose both biological parents are dead, we observe that 3.7 percent of the biological children of our sample host one (or more) single-orphan aged between 0-17 and less than 3 host one (more) double-orphan of 0-17 years old. In other words, biological children are more likely to host foster-children than orphans, either single or double which explains our focus on the impact of foster-children supply on biological children welfare instead of the one of orphans.

school-age foster-relative. This could explain the differences observed in terms of educational outcomes between both sub-samples if parents invest more heavily in the education of their sons relative to their daughters, either because boys have a higher returns to education or because of a preference for sons (Becker, 1994; Behrman et al., 1982, 1986). Wealth and parental education differ also significantly between both sub-samples. More precisely, children hosting school-age foster-relatives have in average more educated parents as well as a higher wealth index than children who do not. Since children education is positively related to the wealth of the household they live in as well as to the education of their biological parents, these characteristics are further explaining factors for the differences observed in terms of school enrollment and basic education attainment between both samples. These characteristics are therefore important to control for to avoid omitted variable bias. Besides, as already mentioned, wealth and care givers' education (and in particular the male's one) are potentially correlated with the decision to host a foster-child. Then accounting for them is also crucial to avoid biases derived from unobserved heterogeneity.

4 Results

4.1 Biprobit Estimation Results

To obtain a consistent estimate of the effect of foster-children supply (W) on biological children education demand (Y), we maximize the following likelihood function:

$$\begin{aligned} ln(L) = &\sum_{Y=1;W=1} ln(Prob[Y=1/W=1]Prob[W=1]) + \sum_{Y=0;W=1} ln(Prob[Y=0/W=1]Prob[W=1]) \\ &+ \sum_{Y=1;W=0} ln(Prob[Y=1/W=0]Prob[W=0]) + \sum_{Y=0;W=0} ln(Prob[Y=0/W=0]Prob[W=0]) \end{aligned} \quad (5)$$

Given the model specification, this can be written

$$
\begin{aligned}
ln(L) = & \sum_{Y=1;W=1} lnBVN(\beta' X_{ihv} + \delta, \mu' Q_{hv}, \rho) + \sum_{Y=0;W=1} lnBVN(-\beta' X_{ihv} - \delta, \mu' Q_{hv}, -\rho) \\
& + \sum_{Y=1;W=0} lnBVN(\beta' X_{ihv}, -\mu' Q_{hv}, -\rho) + \sum_{Y=0;W=0} lnBVN(-\beta' X_{ihv} - \delta, -\mu' Q_{hv}, \rho)
\end{aligned} \tag{6}
$$

where BVN denotes the cumulative distribution function of the bivariate normal distribution and β, δ, μ and ρ are the parameters to be estimated.

The education measure we adopt, Y, is a dummy variable that equals one if the biological child's has attained the 5th level of primary education that is his basic level of education at the date of the interview and zero otherwise. It is explained by X, a vector of exogenous observed characteristics, and by W which measures the presence of school-age foster-relatives in the household h. The equation (2) explains the presence of a school-age foster-relative in the household h by Q, which includes household level characteristics already accounted in X and our exclusion restriction Z.

At the individual level, X includes the biological child's gender and age. If parents have a pro-male bias or if boys have higher returns to education than girls, we expect girls to have a lower probability to reach basic level of education than boys. We expect also that the probability to attain the basic level of education increases with the child's age due to grade repetition and late entry at school.

At the household level, we include in X and Q measures of the parents's educational attainment and of the household's wealth. As already noticed, the parents' educational attainment is measured by a 6-ordered dummy variable from no education (0) to higher education (5)[21]. We expect that the higher is the level of education they attained, the higher is the level of education their children reach, either due to an income channel or due to the preference one. We expect also that households headed by educated parents are more likely to host school-age foster-relatives sent for social mobility purpose. Since the DHS does not measure neither the household's income nor its expenditure, the household's

[21] For polygynous households, the educational attainment of the mother is the one of the first spouse.

living standard is captured by the wealth index as calculated by DHS[22]. We expect that the household's wealth determines positively the biological child's basic level of education attainment since wealth is associated with lower credit constraints and opportunity coast of education. It might also be positively related to the presence of school-age foster-relatives if the latter are sent to wealthier households to increase their social mobility or to manage an economic shock. Note that including in X the educational level attained by the male care-giver as well as a household's wealth indicator are all the more necessary as there are potential channels, besides the foster-children supply one, through which our identifying variable could affect the biological child's level of education attainment.

X and Q include also a measure of the mother's decision power regarding large household purchase. The latter is measured by a dummy variable that equals one if the mother alone has the final say about large household purchase and zero otherwise[23]. According to intra-household resource allocation models, the higher is the mother's power to allocate resources, the higher resources are invested in children welfare (Thomas, 1995). We therefore expect a positive effect of the mother's decision power regarding large household purchase on biological children education. We expect also that such a decision power has a positive effect on the probability to host a school-age foster-relative. Indeed, parents who are looking at fostering their children to increase their education are likely to observe the behavior of potential host parents toward their children to select the best place to send their own children[24]. The mother's decision power regarding household purchase is a good indicator to look at for these parents since it is associated with higher resources devoted to children welfare[25]. We include also the mother's and the father's age in X and Q.

[22]This is a 5-ordered dummy variable ranging households from poorest to richest obtained from a principal component analysis based on their possessions. The advantage of such a wealth measure is that it is likely to be exogenous, material welfare being determined before the arriving of foster-children.

[23]For polygynous households, the decision power of the mother is the one of the first spouse.

[24]An indicator of educational investment made in children prior to the arriving of a child would be ideal. Unfortunately, such indicators are not provided in the DHS dataset.

[25]Besides, there is no obvious reason for a change in the mother's decision power with the arriving of a foster-child which ensures the exogeneity of the variable. Regarding this measure, however, one could argue that the higher is the power of a mother in a household, the lower will be the supply of foster-children coming from the husband's kin group because the mother is expected to favor her biological children.

Following the quantity-quality trade-off theory, the amount of education received by a child should decrease with the number of children (Becker and Lewis, 1973). We therefore include in X the number of pregnancies the male care-giver's spouse(s) had at the date of the survey and expect a negative correlation of the variable with the biological child's 5th level of education attainment[26]. Again, the number of pregnancies is also important to control for since it is likely to be an other channel through which our identifying variable could affect the educational attainment of the host parents' biological child. We also include this variable in Q and assume that foster-children supply decreases with the number of pregnancies, in particular, if they are fostered to wealthier and more educated households.

To characterize further the household size, we include the number of household members excluded the number of non-biological children both in X and Q. This variable measures the effect of remaining members in the household on children level of education attainment[27]. If part of the remaining household members works, their number should enhance the biological child's school level attainment. If part of the remaining household members has joined the household due to some (unobserved) characteristics that explain also the supply of foster-children, we should expect a positive relation between the former and the presence of school-age foster-relatives in the household.

Given the diversity of the ethnic groups in Cameroon, we introduced dummies to identify them both in X and in Q. Following the ethnic classification of the DHS report for Cameroon, we construct 11 ethnic groups to characterize whether the child belongs to the arabe ethnic group, the bui mandara, the adama, the bantoide of the south west, the grassfield, the bamilike bamoun, the cotier, the beti, the kako, to an other or an unknown ethnic groups. Taking as reference group belonging to the bamilike-bamoun (the most dynamic ethnic group located, mostly, in the littoral), we question whether belonging to the 10 other ethnic groups

[26]For polygynous households, the number of pregnancies is the number of pregnancies every resident spouses had at the date of the interview.

[27]Around 19 percent of the children of the sample belong to a polygynous household (two or more spouses resident in the household). For these households, part of the number of remaining household members captures the presence of additional female spouses and of their own children.

enhances or not biological children educational attainment. Included in the same way in Q, we wonder whether some ethnic groups are more likely to host children relative to others. The mother's religion is also taken into account both in X and in Q. 5 dummies are created to characterize whether the child's mother is catholic, protestant, muslim, animist, or has an other religion (including no religion)[28].

At the community level, X and Q include a dummy variable to characterize whether the household is in a rural location or not. Children living in urban location are more likely to reach basic level of education than children in rural location, due to a better access to school inputs. We expect also a negative correlation between the rural location of a household and the presence of school-age foster-relatives if the latter are sent to increase their access to schooling inputs. 10 regional dummies are also introduced in both equations: Adamaoua, Centre, East, Extreme North, North, North West, West, South West, Yaounde. The reference group we adopt is the littoral region[29].

Q further includes the exclusion restriction Z we define above, that is whether the male care-giver of the household is the eldest his brothers. We control besides for the number of his living brothers and sisters to ensure that we capture the fact that the male care-giver is the eldest of his brothers and not simply of his sibship.

Q includes also measures of a household's labor needs since, as already argued, satisfying the labor needs of a household is one motive underlying child fostering. Precisely, we expect that foster-children supply increases with such needs. To measure a household's labor needs, as in Zimmerman (2003), we consider the number of men present in the household assuming that the presence of more men increases the shadow value of domestic labor through the increase of the demand for home-produced goods. Thus, we should observe a positive relation between the presence of school-age foster-relatives and the number of men. We measure the

[28] Since there is no biological child hosting school-age foster-relatives being without religion, we do not include this characteristics among the explaining factor of the decision to host a school-age foster-relative and consider only the characteristic being of an other religion.

[29] We do not include in Q the dummy living in region 5 since, according to the descriptive statistics, we do not observe any biological child hosting a school-age foster-relative with this characteristic.

latter by the number of men resident in the household and aged between 24 and 59 years old. A dummy to characterize whether the household is polygynous, that is whether there are more than two spouses in the household or not is also introduced. The intuition behind this is that polygyny is often explained by higher labor supply needs (Adepoju, 1999). We assume therefore, under the labor motives hypothesis, that the demand for foster-children is positively correlated with polygyny (unless the polygyny structure has satisfied the labor needs). Both of these variables are also included in X to further account for household's size and composition and its impact on a biological child's level of educational attainment[30].

4.1.1 Probit results

Although the estimation is likely to be biased, we propose to estimate equation (1) in probit. Results are presented in table5. To ease the interpretation of the estimated coefficients, marginal effects are also computed and reported in the last two columns. All estimations are clustered at the household level.

Hosting a school-age foster-relative has no significant effect on biological children educational attainment. The related marginal effect is near from zero (-0,007). In other words, biological children do not seem to suffer or benefit in terms of basic educational attainment from the presence of school-age foster-relatives. This suggests that households receiving these children are involved in such a practice due to their higher ability to care for additional children.

Concerning the control variables, as expected, the probability of a child to attain his basic level of education increases with his age, his parents' level of education attained, his household's wealth, and his mother's age. Children who are catholic, protestant and those

[30]As already mentioned, households with higher ability to manage economic shocks are also more likely to host school-age foster-relatives. Measures of such an ability do not exist in our dataset. We would like to introduce measures of the male care-giver's occupation, arguing that children whose father is either a clerical, or a civil servant, or a professor, or in the armed force relative to working as a farmer or in factory or being unemployed are less sensitive to economic shocks. The first fourth work categories could also be thought as measures of the higher connection of a household to influential communities which should increase the probability to host a child fostered to increase his social mobility. Unfortunately, there are too few observations of male care-givers belonging to one of these work categories.

belonging to other religions are more likely to attain this level of education than children who are muslim (the reference group). Surprisingly, it appears that the more decision power has the mother about large household purchase, the less educated is the child. Relative to children who belong to the bamilike bamoun ethnic group (the reference group), children from the the other ethnic groups are significantly less likely to reach their basic education.

4.1.2 Bivariate Probit Results

Table6 presents the bivariate probit results of equation (1) (the biological children education equation). While non-significant in probit estimation, the effect of school-age foster-relatives supply on the probability of biological children to attain their 5th level of primary education is significantly negative in bivariate probit. In other words, biological children significantly suffer from the presence of school-age foster-relatives in terms of educational attainment, once the unobserved heterogeneity between receiving and sending households is taken into account. Computing the related marginal effect, we find that a biological child moving from a situation where he does not host a school-age foster-relative to a situation where he does decreases his probability to attain his 5th level of primary education of 37 percentage point. The estimated effect of the other variables in bivariate probit is rather similar than the one obtained in probit except that the negative effect of the number of pregnancies becomes significant while the negative effect of the mother's power looses its significance in bivariate probit.

Table7 presents the bivariate probit results of equation (2) (the school-age foster-relative supply equation). As expected, whether the father is the eldest of his brothers determines positively and significantly the presence of a school-age foster-relative in the household. This ensures that the model is correctly identified. The decision to host a school-age foster-relative is also positively and significantly related to the spouse's education and of her decision power regarding large household purchase. Relative to muslims (the reference group), catholics, protestants and anismists are more likely to host a school-age foster-relative. Relative to the bamilike-bamoun (the reference group), households from the beti and other (or unknown) ethnic groups are also more likely to host a school-age foster-relative.

Comparing both estimations in probit and in bivariate probit, it appears that the effect of foster-children supply on biological children education demand is upward biased in probit.

4.2 Interpretation of the bivariate probit estimate

According to the likelihood ratio statistic test in table6, we reject the hypothesis that ρ equals zero. This suggests that the two decisions are correlated, making the estimation of the effect of foster-children supply on biological children education demand in bivariate probit appropriate. The Wald test for the same hypothesis leads to the same conclusion: the estimate of ρ is 0.5536, with a standard error of 0.23. The Wald statistic for the test of the hypothesis that ρ equals zero is $(0.5536/0.23) = 5{,}79$. For a single restriction, the critical value from the chi-squared table is 3.84, so the hypothesis is again rejected[31].

To interpret the results obtained, the identification strategy should be recalled back. By adopting the father's birth order among his brothers as our identifying variable, we explain only a part of the foster-children supply. Precisely we explain the presence of foster-children supplied according to the kinship rules. Therefore, the estimated negative effect of foster-children supply on biological children basic level of educational attainment, obtained in bivariate probit, concerns biological children hosting foster-children sent according to these rules. These biological children suffer from the presence of foster-children because the latter are not hosted because of altruism, or higher ability of the household to care for them, but because the father has to host them due to his position within the kin group. And this might

[31]Note that not rejecting the hypothesis that both decisions are uncorrelated does not suggest that the model is better estimated in probit than in bivariate probit. Indeed, this test is not a strict exogeneity one. Greene (2003), using a similar framework to determine the effect of a program on women's studies on the presence of a gender economics course in a liberal arts college's course offerings, cannot reject the absence of correlation between the two decisions. Nonetheless, he maintains that "'Surely, the gender economics and womens studies are highly correlated, but this finding does not contradict that proposition"', p717. Instead, ρ measures the correlation between the disturbances in the equations, the omitted factors (Greene, 1998, 2003; Rhine et al., 2004). That is, ρ measures (roughly) the correlation between the outcomes after the influence of the included factors is accounted for.

tighten the liquidity constraints faced by the household preventing the biological children of host parents from pursuing further their own education.

Note that our identification strategy does not permit to control for child level unobserved heterogeneity. Since the bias derived from the latter can be either positive or negative, it is therefore difficult to assess the way it could affect our estimated effect. However, we can still derive some intuitions from the work of Akresh (2007). He shows indeed that the effect of foster-children supply on the probability of biological children aged between 12-15 years old to be enrolled in school is positive although near from zero in the household fixed effect estimation and becomes significantly negative in the child level fixed effect one. This suggests that omitting to control for child level unobserved heterogeneity upward biases the effect of interest[32]. If a similar bias is at work in our study, the effect of foster-children supply on biological children education demand should be all the more negative.

4.3 Robustness checks

The robustness checks aim at testing the extent to which the father's birth order among his brothers is a relevant exclusion restriction for identifying our model. As already argued, its relevance depends on whether or not we control for the channels, besides the foster-children supply one, through which it could affect the biological child's education demand. We propose in table9 to compare households headed by a male who is either the eldest of his brothers or not on further characteristics such as the number of the male care giver's living brothers and sisters; the number of the mother's living brothers and sisters; the number of living daughters[33]; and the number of school-age orphans hosted[34]; and on some wealth

[32]Such a bias might emerge if households send their children to households with children showing higher abilities at school.

[33]They are the mother's daughters and for mothers married more than once, some of these daughters are actually the male care-giver's step-daughters. If a household counts more than one female spouse, we sum the number of living daughters of each resident spouse to obtain a number at the level of a household.

[34]They are either single or double orphans, defined either as the household's head grand-children, or brother or sister, or other relative or non relative. The difference remains significant if we consider the number of orphans aged between 0-17.

indicators in replacement of the wealth index calculated by DHS[35].

We observe that both types of households differ significantly from each other on the number of the male care-giver's brothers; on the number of living daughters; on the material used to construct the household and on whether the household has a bicycle or not; and a motorcycle or not. Since these characteristics are likely to affect the probability of a biological child to attain his 5th level of education, we have to control for their effect in X to ensure the relevance of our exclusion variable and the identification of the model (there are also included in Q)[36]. Indeed, as already argued in Lloyd and Blanc (1996), a child's educational performance in developing countries is determined not only by the characteristics of his parents but also of his extended family. The higher is a child's number of father's brothers, the higher resources might be within the male kin group and the higher resources can be pooled and shared for children education. If so, a positive effect is expected between the number of the father's brothers and the biological child's probability to attain his 5th level of education. If the expected returns to education of sons is higher than the one of daughters and if credit constraints are biding; or if parents have a preference for sons relative to daughters, then the higher is the number of living daughters among the living children, the higher should be the education invested in a child (Becker, 1994; Behrman et al., 1982, 1986). Under these conditions, we expect that the number of living daughters, given the number of pregnancies, increases the child's probability to attain his 5th level of education. We assume further that children belonging to households whose floor is constructed using cement have higher educational outcomes than the those belonging to household whose floor is constructed using other materials (including earth and wood). Similarly, children whose households have a motorcycle are expected to have higher educational outcomes than others if only wealthier households are able to buy motorcycles [37].

[35] In table8, we provide descriptive statistics of these variables for the biological children samples.

[36] The number of the male care-giver's brothers and sisters are already included in Q in the initial model.

[37] We include in the robustness checks only a dummy for whether the household has a motorcycle since the correlation between having a motorcycle and having a bicycle is high (it equals 0,75). Note that we do not find any significant difference between both types of households on having or not a radio, a TV set, a refrigerator, a car or a truck, or a phone.

We summarize in table10 the estimated effect of our exclusion restriction Z on the probability to host a school-age foster-relative (equation 2) and the estimated effect of the latter supply on the probability of a biological child to attain his 5th level of primary education (equation 1), after the inclusion of the three sets of additional controls[38]. We include first each of the three sets of controls separately and then there are all included in the estimation model. As observed in table10, the estimated effect of the father's birth order within his male sibship on the probability to host a school-age foster-relative remains positive and significant in the fourth specifications. Interestingly, the number of living daughters has a significant negative effect on the probability to host a school-age foster-relative (controlling for the number of pregnancies)[39]. This suggests that the gender-composition of a host sibship matters in the decision to host a foster-child. The estimated effect of foster-children supply on biological children 5th level of education attainment appears also robust to the introduction of these three sets of additional controls. If the household owns a motorcycle, it increases significantly the child's probability to attain his 5th level of education[40].

5 Conclusion

We estimate the spillover effects of hosting school-age foster-relatives on the probability of biological children to attain their 5th level of primary education (basic level of education) in Cameroon. To address the unobserved heterogeneity between sending and receiving households leading probit estimation to be biased, we estimate a recursive bivariate probit model. To identify the latter, we use the father's birth order within his male sibship arguing that in patrilineal societies, eldest brothers are more likely to receive children due to their position within the kin group than all other of his siblings. Estimated in bivariate probit, we find that hosting school-age foster-relatives significantly decreases the probability of biologi-

[38] The estimation result of the whole model for each robustness checks can be provided upon request.

[39] Not shown. It is significant both in the specification where the variable is included alone and in the specification where all the three sets of variables are included.

[40] Not shown. It is significant both in the specification where the variable is included alone and in the specification where all the three sets of variables are included.

cal children to attain their basic level of education. We interpret this result as evidence that households hosting school-age foster-relatives because they have to, due to the obligations of the household's head derived from his position within his kin group, suffer from liquidity constraints preventing them from educating further their own children. Although we cannot control for child level unobserved heterogeneity, we argue that the effect should be all the more negative once accounting for it. Note that our results are obtained for a sample of biological children living a stable households, that is in a household with two parents since the presence of the male care-giver is one condition for obtaining information on his birth order.

This result show that the spillover effects of hosting foster-children on biological children education depend crucially on the motives underlying their presence in a household.

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Table 1: Percentage of Foster-Children in 11 West African countries[1]

Country	Year	Percentage of Foster-children	Number of Children less than 14 years old
Benin	2001	10.7	14388
Burkina Faso	2003	5.9	27900
Ghana	1998	13.2	9379
Guinee	2005	10.2	18243
Ivory Coast	2005	12.1	10069
Liberia	2007	16.8	16095
Mali	2006	7.1	36153
Niger	2006	7.6	24834
Nigeria	1999	6.7	17037
Senegal	2006	10.3	28459
Togo	1998	11.8	19169
All 11 countries		9.5	227195
			Source: Author's calculation and DHS Reports

[a]The information is not provided for Gambia, Cap-Verde, Guinea-Bissau and Sierra-Leone.

Table 2: Characteristics of households headed by a male who is either the eldest of his brothers or who is not and where biological children of 10-14 years old are present

	Father is the eldest brother			**Father is not the eldest brother**			**Test of Significance**
Variable	**Mean (1)**	**Std. Dev.**	**N**	**Mean (2)**	**Std. Dev.**	**N**	**(1) - (2)** [1]
N. foster relative 6-14 hosted	0.131	0.453	329	0.076	0.304	275	+*
N. foster non relative 6-14 hosted	0.003	0.055	329	0.018	0.134	275	-*
N. pregnancies[2]	7.191	3.717	329	6.436	2.882	275	+***
N. dead children	1.03	1.446	329	0.873	1.131	275	+
Father's Educ.	1.772	1.377	329	2.142	1.459	275	-***
Mother's Educ.	1.359	1.237	329	1.622	1.282	275	-**
Wealth Index	2.733	1.397	329	3.105	1.465	275	-***

[a]* p<0.10, ** p<0.05, *** p<0.01. The test of significance of mean difference is done given unequal variance.
[b]Demographic variables are calculated at the household level (not at the mother's one).

Table 3: Percentage of biological children of our sample hosting foster-children, by age and relationship

Variable	**Mean**	**S. D.**	**N**
Perc. of biological children hosting non-biological child(ren) 0-17	0,2184	0,41	925
Perc. of biological children hosting foster-child(ren) 0-17	0,1729	0,37	925
Perc. of biological children hosting foster-child(ren) 6-14	0,1016	0,30	925
Prop. of foster-grand-child(ren) among the hosted foster-children 6-14	0,0445	0,19	202
Prop. of foster-other relative(s) among the hosted foster-children 6-14	0,2970	0,43	202
Prop. of foster-brother/sister(s) among the hosted foster-children 6-14	0,0544	0,23	202
Prop. of foster-non relative(s) among the hosted foster-children 6-14	0,0198	0,14	202
Perc. of biological children hosting single-orphan(s) 0-17	0,0367	0,18	925
Perc. of biological children hosting double-orphan(s) 0-17	0,0237	0,15	925

Table 4: Descriptive Statistics of the Biological Children Sample

	Whole Sample			**With school-age Foster-relative** [1]			**Without school-age Foster-relative**		
Variable	Mean	S. D.	Obs	Mean	S. D.	Obs	Mean	S. D.	Obs
enrollment	0,8806	0,32	921	1,0000	0,00	69	0,8709	0,34	852
5th level attained	0,4789	0,50	925	0,6232	0,49	69	0,4673	0,50	856
gender (female)	0,4778	0,50	925	0,4058	0,49	69	0,4836	0,50	856
age	11,8335	1,43	925	11,7246	1,36	69	11,8423	1,43	856
Mother's age[2]	36,8205	5,97	925	37,3768	5,34	69	36,7757	6,02	856
Father's age	44,7730	7,15	925	43,7536	6,95	69	44,8551	7,17	856
Mother's educ.	1,4314	1,27	925	2,1594	1,30	69	1,3727	1,24	856
Father's educ.	1,9114	1,43	925	2,5217	1,39	69	1,8622	1,42	856
Wealth index	2,9027	1,45	925	3,5072	1,48	69	2,8540	1,44	856
N. pregnancies per HH[3]	7.4821	3.97	925	6.2173	3.23	69	7.5841	4.01	856
N. HH members [4]	8,3092	3,85	925	7,8696	2,95	69	8,3446	3,91	856
Catholic	0,3496	0,48	924	0,5072	0,50	69	0,3368	0,47	855
Protestant	0,3463	0,48	924	0,4058	0,49	69	0,3415	0,47	855
Muslim	0,1764	0,38	924	0,0290	0,17	69	0,1883	0,39	855
Animist	0,0465	0,21	924	0,0435	0,21	69	0,0468	0,21	855
No religion	0,0509	0,22	924	0,0000	0,00	69	0,0550	0,23	855
Other religion	0,0303	0,17	925	0,0145	0,12	69	0,0315	0,17	856
Rural	0,5751	0,49	925	0,4638	0,50	69	0,5841	0,49	856
regiond1	0,0930	0,29	925	0,0580	0,24	69	0,0958	0,29	856
regiond2	0,0681	0,25	925	0,1449	0,35	69	0,0619	0,24	856
regiond3	0,0768	0,27	925	0,1449	0,35	69	0,0713	0,26	856
regiond4	0,0681	0,25	925	0,1014	0,30	69	0,0654	0,25	856
regiond5	0,1276	0,33	925	0,0000	0,00	69	0,1379	0,34	856
regiond6	0,0681	0,25	925	0,0580	0,24	69	0,0689	0,25	856
regiond7	0,1362	0,34	925	0,0725	0,26	69	0,1414	0,35	856
regiond8	0,0778	0,27	925	0,1159	0,32	69	0,0748	0,26	856
regiond9	0,0832	0,28	925	0,1159	0,32	69	0,0806	0,27	856
regiond10	0,0746	0,26	925	0,0145	0,12	69	0,0794	0,27	856
regiond11	0,0638	0,24	925	0,0870	0,28	69	0,0619	0,24	856
regiond12	0,0627	0,24	925	0,0870	0,28	69	0,0607	0,24	856
arabe	0,0789	0,27	925	0,0145	0,12	69	0,0841	0,28	856
bui mandara	0,1405	0,35	925	0,0435	0,21	69	0,1484	0,36	856
adama	0,1546	0,36	925	0,1449	0,35	69	0,1554	0,36	856
bamilike bamoun	0,2141	0,41	925	0,1884	0,39	69	0,2161	0,41	856
bantoide south west	0,0259	0,16	925	0,0145	0,12	69	0,0269	0,16	856
grassfiled	0,0789	0,27	925	0,1449	0,35	69	0,0736	0,26	856
cotier	0,0389	0,19	925	0,0290	0,17	69	0,0397	0,20	856
beti	0,1968	0,40	925	0,3333	0,47	69	0,1857	0,39	856
kako	0,0422	0,20	925	0,0435	0,21	69	0,0421	0,20	856
other/unknown ethnic group	0,0291	0,16	925	0,0434	0,20	69	0,0280	0,16	856
Father= eldest brother	0,5449	0,50	925	0,6377	0,48	69	0,5374	0,50	856
N. father's living brothers	1,9049	1,57	925	2,1159	1,93	69	1,8879	1,54	856
N. father's living sisters	2,0703	1,68	925	2,5797	1,85	69	2,0292	1,65	856
N. men 24-59	1,0908	0,35	925	1,1884	0,49	69	1,0829	0,34	856
Polygyny	0,1881	0,39	925	0,1014	0,30	69	0,1951	0,40	856
Mother's has final say *alone* on large household purchase	0,1081	0,31	925	0,2029	0,41	69	0,1005	0,30	856

[a] The school-age foster-relatives considered do not include foster-grand-children.

[b] In polygynous households, the mother's age (and education) is the one of the first spouse.

[c] All the pregnancies a mother had; for polygynous households, all pregnancies of resident spouses.

[d] Excluded non biological children.

Table 5: Probit estimation: Effect of Hosting School-age Foster-relatives on Biological Children Probability to Attain the 5th Level of Primary Education [1]

Dependant Variable: A Biological Child has attained his 5th Level of Education				
	Probit Estimation		**Marginal Effects**	
Variable	**Coeff.**	**SE**	**Coeff.**	**SE**
HH hosts a foster-rel. 6-14	-0.019	(0.24)	-0.007	(0.10)
Gender (female)	-0.061	(0.11)	-0.024	(0.04)
Age	0.369***	(0.04)	0.147***	(0.02)
N. pregnancies per HH	-0.043	(0.03)	-0.017	(0.01)
N. HH members	0.013	(0.03)	0.005	(0.01)
Mother's age	0.029*	(0.02)	0.012*	(0.01)
Father's age	0.003	(0.01)	0.001	(0.00)
Mother's educ.	0.408***	(0.08)	0.163***	(0.03)
Father's educ.	0.155**	(0.07)	0.062**	(0.03)
Wealth	0.255***	(0.07)	0.102***	(0.03)
Mother's power	-0.312*	(0.18)	-0.123*	(0.07)
Rural	-0.175	(0.16)	-0.070	(0.06)
Catholic	0.645***	(0.23)	0.252***	(0.09)
Protestant	0.733***	(0.24)	0.285***	(0.09)
Animist	0.253	(0.37)	0.100	(0.14)
No/other religion	0.611**	(0.28)	0.233**	(0.10)
arabe	-1.015***	(0.39)	-0.356***	(0.10)
bui mandara	-0.713*	(0.37)	-0.269**	(0.13)
adama	-0.935***	(0.31)	-0.342***	(0.09)
bantoide south west	-0.780*	(0.46)	-0.283**	(0.14)
grassfiled	-0.743**	(0.36)	-0.276**	(0.12)
cotier	-0.684*	(0.37)	-0.254**	(0.12)
beti	-0.390*	(0.23)	-0.153*	(0.09)
kako	-0.728**	(0.32)	-0.269***	(0.10)
other/unknown	-0.806**	(0.40)	-0.292**	(0.12)
Polygyny	0.112	(0.20)	0.045	(0.08)
N. men 24-59	0.100	(0.16)	0.040	(0.06)
Other controls[4]			YES	
Constant	-7.388***	(0.83)		
Pseudo R-squared			0.414	
ll			-374.9212	
N. obs. (N. clusters)			924 (603)	

[a]* p<0.10, ** p<0.05, *** p<0.01; the estimation is robust to household level clustering
[b]Reference group for religion: Muslim
[c]Reference group for ethnic group: bamilike bamoun
[d]Other controls include regional dummies (ref.: the littoral).

Table 6: Biprobit Estimation of Equation (1): The Biological Children Education Equation [1]

Dependant variable: A Biological Child has attained his 5th Level of Education			
	Biprobit Coeff.		**SE**
HH hosts a foster-rel. 6-14[2]	-1,0853	**	0,56
Gender (female)	-0,0591		0,10
Age	0,3580	***	0,04
N. Pregnancies per HH	-0,0454	*	0,03
N. HH member	0,0148		0,03
Mother's age	0,0292	**	0,02
Father's age	0,0015		0,01
Mother's educ.	0,4161	***	0,08
Father's educ.	0,1417	**	0,07
Wealth	0,2572	***	0,07
Mother's power	-0,2299		0,18
Rural	-0,1746		0,15
Catholic[3]	0,7280	***	0,23
Protestant	0,7812	***	0,24
Animist	0,3722		0,35
No/other religion	0,5901	**	0,28
arabe[4]	-0,9309	**	0,38
bui mandara	-0,6735	**	0,35
adama	-0,8366	***	0,28
bantoide SO	-0,7401	*	0,44
grassfield	-0,6262	*	0,36
cotier	-0,6434	*	0,36
beti	-0,2722		0,23
kako	-0,6876	**	0,30
other/unknown	-0,6488		0,40
Polygyny	0,1178		0,20
N. men 24-59	0,1539		0,16
Constant	-7,2902	***	0,86
Other controls[5]		YES	
ρ	0,5536		0,23
LR test of ρ=0	chi2(1)		3.4964
	Prob>chi2		0.0615
ll	-570.4895		
N		924	

[a]* p<0.10, ** p<0.05, *** p<0.01; the estimation is robust to household level clustering
[b]The related marginal effect equals -0,3706 with a standard error of 0.14 and is significant at 5 percent level
[c]Reference group for religion: Muslim
[d]Reference group for ethnic group: bamilike bamoun
[e]Other controls include regional dummies (ref.:the littoral)

Table 7: Biprobit Estimation of Equation (2): The School-Age Foster-Relative Supply Equation [1]

Dependant variable: the HH hosts a School-Age Foster-relative			
	Coeff.		**SE**
Father is the eldest of his brothers	0,3985	**	0,20
Father's N. of living sisters	0,0746		0,05
Father's N. of living brothers	0,0497		0,06
N. pregnancies per HH	-0,0507		0,05
N. HH members	0,0296		0,03
Mother's age	0,0080		0,02
Father's age	-0,0135		0,02
Mother's educ.	0,2315	**	0,10
Father's educ	-0,0789		0,09
Wealth	0,1034		0,10
Mother's power	0,3847	*	0,23
Rural	0,0641		0,22
Catholic[2]	1,2197	***	0,36
Protestant	0,9672	***	0,35
Animist	1,4011	***	0,50
Other religion	0,5360		0,62
arabe[3]	0,7818		0,56
bui mandara	0,1087		0,49
adama	0,6129		0,40
bantoide SO	-0,2569		0,54
grassfield	0,5556		0,34
cotier	0,0616		0,50
beti	0,7150	**	0,30
kako	0,0663		0,47
other/unknown	0,9609	**	0,47
Polygyny	0,0872		0,35
N. men 24-59	0,2102		0,19
Constant	-3,9661	***	0,84
Other controls[4]		YES	
N		924	

[a]* p<0.10, ** p<0.05, *** p<0.01; the estimation is robust to household level clustering

[b]Reference group for religion: Muslim

[c]Reference group for ethnic group: bamilike bamoun

[d]Other controls include regional dummies (ref.: the littoral).

Table 8: Robustness Checks: Descriptive Statistics of the Biological Children Sample

	Whole Sample			**With School-age Foster-relative**			**Without School-age Foster-relative**		
Variable	Mean	S. D.	Obs	Mean	S. D.	Obs	Mean	S. D.	Obs
N. mother's living brothers	2,1254	1,54	925	2,4638	1,51	69	2,0981	1,54	856
N. mother's living sisters	2,2000	1,75	925	2,0725	1,80	69	2,2103	1,74	856
Electricity access	0,5103	0,78	925	0,7971	1,18	69	0,4871	0,74	856
Floor =cement	0,3838	0,49	925	0,5072	0,50	69	0,3738	0,48	856
Source water= home	0,0886	0,28	925	0,2029	0,41	69	0,0794	0,27	856
HH has a motorcycle	0.16030	0.36	917	0.14925	0.35	67	0.16117	0.36	850
HH has a bicycle	0.24754	.43	917	0.17910	0.38	67	0.25294	0.43	850
N. living daughters[2]	3.2443	2.12	925	2.4637	1.57	69	3.3072	2.15	856
N. hosted orphans 6-14[1]	0.03135	0.18	925	0.04347	0.20	69	0.03037	0.17	856

[a]Calculated at the level of a household.
[b]Either single or double, grand-children, head's brother or sister, or other relative or non relative.

Table 9: Characteristics of households headed by a male who is either the eldest of his brothers or who is not and where biological children of 10-14 years old are present

	Father is the eldest brother			**Father is not the eldest brother**			
Variable	**Mean (1)**	**Std. Dev.**	**N**	**Mean (2)**	**Std. Dev.**	**N**	**(1) - (2)** [1]
N. father's living brothers	1.362	1.44	329	2.495	1.357	275	-***
N. father's living sisters	2.064	1.705	329	2.051	1.591	275	+
N. mother's living brothers	2.088	1.494	329	2.196	1.616	275	-
N. mother's living sisters	2.134	1.64	329	2.335	1.818	275	-
N. living daughters[2]	3.060	0.11	329	2.778	0,10	275	+*
N. orphans 6-14 [3]	0,036	0,01	329	0,029	0,01	275	+
Access to electricity	0,501	0,05	329	0,502	0,03	275	-
Source water=home	0,088	0,01	329	0,098	0,02	275	-
Floor=cement	0.343	0,02	329	0,418	0,03	275	-*
Has a bicycle	0,362	0,05	329	0,207	0,02	275	+***
Has a motorcycle	0,246	0,05	329	0,131	0,02	275	+**

[a]* p<0.10, ** p<0.05, *** p<0.01. The test of significance of mean difference is done given unequal variance.
[b]Calculated at the level of a household.
[c]Either single or double, grand-children, head's brother or sister, or other relative or non relative.

Table 10: Robustness Checks: Biprobit Estimation of Equations (1) and (2)[1]

	N. father's brothers[2]		N. living daughters [3]		Wealth Indicators[4]		All	
	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE
Estimation of equation (1)								
HH hosts a school-age foster-relative	-1.0853**	0.56	-1.0372*	0.58	-1.1959*	0.67	-1.1482*	0.69
Estimation of equation (2)								
Father is the eldest of his brothers	0.3984**	0.19	0.4200**	0.20	0.3981**	0.20	0.4161**	0.20
ρ	0.5536	0.23	0.5278	0.24	0.6187	0.28	0.5879	0.29
LR test of $\rho = 0$								
chi2(1)	3.4252		2.99565		2.4929		2.22904	
Prob > chi2	0.0642		0.0835		0.1144		0.1354	
LL	-570.48958		-567.95533		-565.83812		-563.06352	
N	924		924		917		917	

[a]* p<0.10, ** p<0.05, *** p<0.01; the estimation is robust to household level clustering
[b]Additional variable included: N. father's living brothers
[c]Additional variable included: N. living daughters
[d]Variables included in replacement of the wealth index: the material floor is in cement; the household has a motorcycle